Optimization of ketoprofen adsorption from aqueous solutions and simulated effluents using H_2SO_4 activated Campomanesia guazumifolia bark

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Abstract

This study used the bark of the forest species Campomanesia guazumifolia modified with H_2SO_4 to absorb the anti-inflammatory ketoprofen from aqueous solutions. FTIR spectra confirmed that the main bands remained after the chemical treatment, with the appearance of two new bands related to the elongation of the carbonyl group present in hemicellulose. Micrographs confirmed that the surface started to contain a new textural shape after acid activation, having new pores and cavities. The drug adsorption's optimum conditions were obtained by response surface methodology (RSM). The adsorption was favored at acidic pH (2). The dosage of 1 g L^{-1} was considered ideal, obtaining good indications of removal and capacity. The Elovich model very well represented the kinetic curves. The isotherm studies indicated that the increase in temperature negatively affected the adsorption of ketoprofen. A maximum adsorption capacity of 158.3 mg g^{-1} was obtained at the lower temperature of 298 K. Langmuir was the best-fit isotherm. Thermodynamic parameters confirmed the exothermic nature of the system (ΔH^0 = −8.78 kJ mol^{-1}). In treating a simulated effluent containing different drugs and salts, the removal values were 35, 50, and 80% at 15, 30, and 180 min, respectively. Therefore, the development of adsorbent from the bark of Campomanesia guazumifolia treated with H_2SO_4 represents a remarkable alternative for use in effluent treatment containing ketoprofen.

Keywords: Campomanesia guazumifolia; acid treatment; adsorption; bark; ketoprofen.